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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|-------------|----------------------|---------------------|------------------|
| 10/743,573 | 12/22/2003 | Bo-Yeoun Jo | OPP031368US | 7992 |
| 36872 | 7590 | 10/27/2006 | EXAMINER | |
| THE LAW OFFICES OF ANDREW D. FORTNEY, PH.D., P.C. 401 W FALLBROOK AVE STE 204 FRESNO, CA 93711-5835 | | | SMITH, BRADLEY | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 2891 | |

DATE MAILED: 10/27/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | | |
|------------------------------|------------------------|---------------------|--|
| Office Action Summary | Application No. | Applicant(s) | |
| | 10/743,573 | JO, BO-YEOUN | |
| | Examiner | Art Unit | |
| | Bradley K. Smith | 2891 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 10/11/06.
 2a) This action is FINAL. 2b) This action is non-final.
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1,2 and 5-22 is/are pending in the application.
 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
 5) Claim(s) _____ is/are allowed.
 6) Claim(s) 1,2 and 5-22 is/are rejected.
 7) Claim(s) _____ is/are objected to.
 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
 10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____. C | 6) <input checked="" type="checkbox"/> Other: <u>search notes</u> . |

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 2, 19, 21 and 22 are rejected under 35 U.S.C. 102(e) as being anticipated by Kai et al. (2003/0008467). Kai disclose a MIM capacitor and etching the second metal layer and the dielectric layer under conditions different from etching the second metal layer to leave a residual dielectric layer over the first metal layer in an etched part of the dielectric layer (see paragraphs 0049-0052, figures 7 and 8). With regards to claim 2, Kai et al. disclose etching the second metal layer with a first RIE (paragraph 0050 and paragraph 0034 disclose the TiN can be etched by RIE), and etching the insulation layer with a second RIE (paragraph 0052). With regards to claim 19, Kai et al. disclose using a photoresist (40). With regards to claims 21 and 22, Kai et al. disclose the dielectric layer is silicon nitride and the residual dielectric layer is continuous.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 5 and 12 – 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kai *et al.* in view of Hwang.

Kai *et al.* teaches a fluorine etching gas for the metal layer and a chlorine etching gas for the dielectric layer [column 9, lines 25-40], but does not discuss the particular etch chemistries and etch parameters. Hwang (US 2003/0064590) teaches etching gases of Cl₂, CHF₃, and Ar for metal and Cl₂ and Ar for dielectric layers and the claimed etch gas ratios and RIE plasma etch parameters [0100, Table VI, 0132]. It would have been obvious to one of ordinary skill in the art to use the etching gases and etch parameters of Hwang in the method of Kai *et al.* since Hwang teaches that these parameters provide a clean etch profile without the need for vigorous post etch cleaning and where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. See *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

3. Claims 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kai *et al.* in view of Ouellet *et al.*

Kai *et al.* teaches a metal layer formed of a titanium nitride (Ti/TiN) interconnection metal layer, but does not discuss forming a second metal layer in the capacitor with a Ti/TiN layer with the claimed thicknesses. Ouellet *et al.* (US 6,083,805) teaches a capacitor metal layer formed of a Ti/TiN with a thickness of 1000 Å [column 3, lines 20-30]. It would have been obvious to one of ordinary skill in the art to use the

dual metal layers of Ouellet *et al.* in the method of Kai *et al.* since Ouellet *et al.* teaches that Ti/TiN layers provide reduced stress in the capacitor electrode, and where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. See *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

4. Claims 8 – 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kai *et al.* in view of Allman *et al.*

Kai *et al.* teaches a metal layer but does not discuss the particular thicknesses of these layers. Allman *et al.* teaches a metal layer with a thickness of 1,600 Å [0022, 0025] and a dielectric of nitride with a thickness of 450 Å [0025]. It would have been obvious to one of ordinary skill in the art to use the thicknesses and dielectric of Allman *et al.* in the method of Kai *et al.* since Allman *et al.* teaches that these thicknesses provide protection for lower layers during plasma etching and silicon nitride provides improved dielectric properties.

5. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kai *et al.* in view of Tee *et al.*

Kai *et al.* teaches a stacked metal layer, but does not discuss a Ti/TiN/AlCu/Ti/TiN metal layer. Tee *et al.* (US 2002/0052077) teaches a Ti/TiN/AlCu/Ti/TiN metal layer for a capacitor [0031]. It would have been obvious to one of ordinary skill in the art to use the stacked metal layer of Tee *et al.* in the method of Kai *et al.* since this layer prevents reaction with the underlying substrate.

6. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kai *et al.* in view of Subramanian *et al.*

Kai *et al.* teaches a photoresist layer but does not discuss the photoresist thickness. Subramanian *et al.* (US 5,494,837) teaches a photoresist with a thickness of 10,000 Å [column 4, line 52]. It would have been obvious to one of ordinary skill in the art to use a thickness of 11,000 to 15,000 Å in the method of Kai *et al.* since Subramanian *et al.* teaches that a similar thickness is well known in the art for RIE methods and where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. See *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). Furthermore a thicker photoresist would offer more protection.

Response to Arguments

Applicant's arguments filed 10/11/06, with respect to the rejection(s) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Kai *et al.* (2003/0008467).

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

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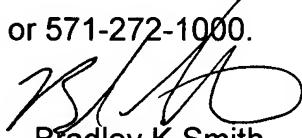
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Bradley K. Smith whose telephone number is 571-272-1884. The examiner can normally be reached on 10-6.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Baumeister can be reached on 571-272-1722. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Bradley K Smith
Primary Examiner
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